

## DETERMINATION OF MINERAL COMPOSITION OF THE RED POOL TYPE OF RED CURRANT (*RIBES RUBRUM L*, GROSSULARIACEAE)

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Red currant (*Ribes rubrum L*, Grossulariaceae) is a highly valued species due to the nutritional and health benefits of its juices and fruits (1). A wide range of nutrients (carbohydrates, vitamins, minerals, organic acids), as well as antioxidant components (polyphenols and vitamin C) make red currant one of the most important plant species (2). The unique color, aroma, taste and content rich in minerals and vitamins make this plant species one of the sources of functional food and nutraceuticals. A major challenge for scientists in the fields of nutrition, food chemistry and physiology is to determine the optimal intake of natural antioxidants and mineral components through a functional diet (3). The aim of this study was to determine the mineral composition of red currant juice, of the Red Pool type, in order to evaluate its application in nutrition, cosmetology and pharmacy. The research included the determination of 22 chemical elements (Ag, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, Pb, Sr, Tl, Zn, Si, P and S). Sample preparation for the analysis was performed by wet digestion, after which the concentration of elements was determined by inductively coupled plasma - optical emission spectrometry (ICP-OES). The results are presented in Table I.

**Table I** Mineral composition of red currant juice of the Red Pool type

Element	Concentration (µg/g)	Element	Concentration (µg/g)
Ag	0	Mg	396
As	0	Mn	2.7
Ba	5.9	Na	230
Ca	1581	Ni	0.15
Cd	0	Pb	0
Co	0	Sr	32.3
Cr	0	Tl	0
Cu	15	Zn	9.4
Fe	32	Si	8.1
K	22914	P	5548
Li	0.5	S	635

The concentration of mineral elements decreases in the following order: K>P>Ca>S>Mg>Na>Sr>Fe>Cu>Zn>Si>Ba>Li>Mn>Ni. The obtained results showed the absence of elements such as Cd, Pb and As. This is important because their deposition and accumulation in the soil can affect the quality of vegetables and fruits, and they also display exceptional toxicity even at very low concentrations. Ag, Co, Cr and Tl were not detected in the juice sample, as well. Regarding macronutrients, red currant fruits contain the highest concentrations of K, P, Ca, Mg and Na, which cause numerous physiological effects in humans. Also, the tested species contains significant amounts of essential minerals (Fe, Zn and Cu), which are very important for the improvement of the general condition of the organism. The obtained results confirm that red currant is a valuable source of nutrients. Since this research has determined that red currant juice does not contain toxic metals, its application in cosmetology, pharmacy and nutrition is possible. Since the content of toxic metals, as well as the mineral composition itself, depend on the state of the environment and the growing climate of the plant itself, caution is always recommended before use.

## References

1. Djordjevic et al. Biochemical Properties of Red Currant Varieties in Relation to Storage. *Plant Foods Hum. Nutr.* 2010; 65:326–332.
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3. Moyer R.A, Hummer K.E, Finn C.E, Frei B, Wrolstad A.E. Anthocyanins, phenolics, and antioxidant capacity in diverse small fruits: *Vaccinium*, *Rubus*, and *Ribes*. *J. Agric. Food Chem.* 2002; 50:519–525.

## ODREĐIVANJE MINERALNOG SASTAVA SORTE RED POOL CRVENE RIBIZLE (*RIBES RUBRUM L*, GROSSULARIACEAE)

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Crvena ribizla (*Ribes rubrum L*, Grossulariaceae) predstavlja veoma cenjenu vrstu zbog hranjivih i zdravstvenih benefita njenih sokova i plodova (1). Širok spektar hranjivih jedinjenja (ugljeni hidrati, vitamini, minerali, organske kiseline), kao i antioksidativnih komponenti (polifenoli i vitamin C) čine crvenu ribizlu jednom od najznačajnijih biljnih vrsta (2). Jedinствена boja, miris, ukus i sadržaj bogat mineralima i vitaminima ubraja ovu biljnu vrstu u izvore funkcionalne hrane i nutriceutike. Veliki izazov za naučnike na polju nutricionizma, hemije hrane i fiziologije je određivanje optimalnog unosa prirodnih antioksidanata i mineralnih komponenti putem funkcionalne ishrane (3). Cilj ovog istraživanja bio je određivanje mineralnog sastava soka crvene ribizle, vrste Red Pool, kako bi se mogla proceniti njegova primena u ishrani, kozmetologiji i farmaciji. Vršeno je određivanje 22 elementa (Ag, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, Pb, Sr, Tl, Zn, Si, P i S). Priprema uzorka za analizu vršena je vlažnom digestijom, nakon čega je koncentracija elemenata određivana metodom indukcije spregnutom plazmom – optičko-emisionom spektrometrijom (ICP-OES). Rezultati su prikazani u Tabeli I.

**Tabela I** Mineralni sastav soka vrste Red Pool crvene ribizle

Element	Koncentracija (µg/g)	Element	Koncentracija (µg/g)
Ag	0	Mg	396
As	0	Mn	2.7
Ba	5.9	Na	230
Ca	1581	Ni	0.15
Cd	0	Pb	0
Co	0	Sr	32.3
Cr	0	Tl	0
Cu	15	Zn	9.4
Fe	32	Si	8.1
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Li	0.5	S	635

Sadržaj mineralnih elemenata opada sledećim redosledom: K>P>Ca>S>Mg>Na>Sr>Fe>Cu>Zn>Si>Ba>Li>Mn>Ni. Dobijeni rezultati su pokazali odsustvo elemenata kao što su Cd, Pb i As. Ovo je značajno, jer njihovo taloženje i akumulacija u zemljištu može uticati na kvalitet povrća i voća, a takođe pokazuju i izuzetnu toksičnost i pri jako niskim koncentracijama. Takođe, u uzorku soka nisu detektovani ni Ag, Co, Cr i Tl. Od makronutrijenata, plodovi crvene ribizle sadrže najviše koncentracije K, P, Ca,

Mg i Na, koji izazivaju brojne fiziološke efekte kod ljudi. Takođe, ispitana vrsta sadrži značajne količine esencijalnih minerala (Fe, Zn i Cu), koji su veoma bitni za poboljšanje opšteg stanja organizma. Dobijeni podaci potvrđuju da crvena ribizla predstavlja dragocen izvor hranjivih sastojaka. Kako smo ispitivanjem utvrdili da sok crvene ribizle ne sadrži toksične metale, njegova primena u kozmetologiji, farmaciji i ishrani je moguća. S obzirom da sadržaj toksičnih metala, kao i sam mineralni sastav zavise od stanja životne sredine i od podneblja gajenja same biljke, uvek se preporučuje oprez pre upotrebe.

## **Literatura**

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